



Geomorphological context of the basins of Northwestern Peninsular Malaysia

Benjamin Sautter, Manuel Pubellier, and David Menier
Ecole Normale Supérieure, Paris, France (benjamin_sautter@hotmail.fr)

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Department of Petroleum Geosciences, Universiti Teknologi PETRONAS
CNRS-UMR 8538, Ecole Normale Supérieure, 24, Rue Lhomond, 75231, Paris Cedex 05, France

Petroleum basins of Western Malaysia are poorly known and their formation is controlled by the Tertiary stress variations applied on Mesozoic basement structures. Among these are the Paleozoic-Mesozoic Bentong Raub, Inthanon, and Nan suture zones. By the end of Mesozoic times, the arrival of Indian plate was accompanied by strike slip deformation, accommodated by several Major Faults (Sagaing, Three Pagodas, Mae Ping, Red River, Ranong and Klong Marui Faults). Due to changes in the boundary forces, these areas of weakness (faults) were reactivated during the Tertiary, leading to the opening of basins in most of Sundaland. Within this framework, while most of the Sundaland records stretching of the crust and opening of basins (SCS, Malay, Penyu, Natuna, Mergui) during the Cenozoics, Peninsular Malaysia and the Strait of Malacca are considered to be in tectonic quiescence by most of the authors. We present the geomorphology of the Northwestern Malaysia Peninsula with emphasis on the deformations onshore from the Bentong Raub Suture Zone to the Bok Bak Fault, via the Kinta Valley, and offshore from the Port Klang Graben to the North Penang Graben.

By analyzing Digital Elevation Model from ASTER and SRTM data, two main directions of fractures in the granitic plutons are highlighted: NW-SE to W-E sigmoidal faults and N-S to NE-SW linear fractures which seem to cross-cut the others. In the field in the area of the Kinta Valley (Western Belt, NW Peninsular Malaysia), granitic bodies show intense fracturation reflecting several stages of deformation. The granites are generally syntectonic and do not cut fully across the Late Paleozoic platform limestone. Two sets of fractures (NW-SE and NE-SW) appear more penetrative in both granitic and limestone units. On most of the studied outcrops, exfoliation fractures are reactivated into normal faults. Deformation is particularly severe at the contact of the granites and the sediments which is underlined by cataclastic quartz dykes and hornfelds. Off-shore, in the Straits of Malacca, nine tertiary half-grabens are present, all oriented in N-S to NE-SW direction with N-S boundary faults on their western margin. We propose a tectonic scenario for the north-western Malaysia Peninsula according to which the northward motion of India induced first right-lateral transpressional tectonics at the End of the Mesozoics (Cretaceous early Tertiary). This system is illustrated in the NW-SE trending fractures of the Main Range Batholith and other Triassic plutons within a system bounded and controlled by the Bok Bak Fault, the KL fault zone and the Bentong Raub Suture Zone. Later, a second stage of transtension led to the opening of the en echelon onshore basins in a tear-faults system, and to the opening of half grabens offshore in the Straits of Malacca.